Residential Asphalt Roofing

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Introduction

Purpose

This unit will prepare students with the skills necessary to roof, flash, and vent a residential dwelling.

Core Objective:
After completing this core learning experience, the student will be able to discuss roof construction and apply roofing, flashing and ventilation. All of the skills obtained will meet the minimum CABO one and two family dwelling unit builder's code book standards. The student will show this though various types of evaluations.

Objectives:

- Match terms associated with roofing to their correct definitions.
- State safety rules pertaining to roofing.
- Identify parts of a roof.
- Identify traditional residential roof designs.
- Name classes of roofing.
- List types of roofing materials.
- Identify basic types of asphalt shingles.
- List guidelines for applying underlayment.
- Describe general requirements for applying flashing.
- List types of flashing.
- Estimate roofing materials needed for a three-tab asphalt shingle.
- Estimate roofing materials needed for an architectural asphalt shingle.
- Demonstrate the ability to
    - Apply three-tab asphalt shingles, to code.
    - Apply architectural asphalt shingles, to code.

Estimated Time: 17hrs- 20hrs

Standards

The following standards are addressed by this core learning experience**.**

Industry Standards:

- **903.1 General.** Asphalt shingles shall be applied only to solidly sheathed roofs. Asphalt shingles shall be applied according to the manufactures printed instructions and this code.
- **902.1 Supporting construction.** Roofing shall be applied only when the supporting roof construction is clean and dry.
- **902.2 Single layer underlayment**. When a single ply of underlayment is required it shall be laid parallel to the eaves with a 2-inch top lap and a 4-inch end lap nailed sufficiently to hold in place.
- **903.4 Fasteners**. Asphalt shingles shall be fastened according to the manufacture's printed instructions and table 903.4.
- **903.5 Valley flashing.** Roof valleys shall be flashed by one of the methods listed in section 903.5.1 through 903.5.3. Asphalt shingles shall be applied according to the manufacture's printed instructions.
- **903.5.1 Sheet metal.** Open roof valleys may be provided if not less than no. 28gage galvanized corrosion-resistant sheet metal and shall extend at least 8 inches from the center line each way. Sections of flashing shall be jointed to provide an adequate water lock.
- **903.5.3 Multiple layer flashing**. Roof valley flashing may be of laced composition shingles, applied in an approved manner, with an underlay of not less than 30-lb felt extending 10 inch from the center line each way, or shall be of two layers of 90lb mineral surfaced cap sheet cemented together with the bottom layer not less than 12 inches wide laid face down and the top layer not less than 24 inches wide laid face up.
- **903.6 Side wall flashing.** Flashing against a vertical side wall shall be by the step –flashing method.
- **903.7 Other flashing**. Flashing against vertical front wall, as well as soil stack, vent pipe and chimney flashing, shall be applied according to asphalt shingle manufacture's printed instructions.
- **903.8 Hips and ridges.** Hip and ridge shingles shall be fastened according to the manufactures printed instructions and table 903.4. Hip and ridge weather exposure shall not exceed that permitted for the field of roof.

New Standards Performance Standards:

- **M2a** Models situations geometrically to formulate and solve problems.
- **M2e** Knows, uses, and derives formulas for perimeter, circumference, area surface area, and volume of many types of figures.
- **M2i** Compares slope and angle of elevation as measures of steepness.

- **M3a** Models given situations with formulas and functions, and interprets given formulas and functions in terms of situations.
- **M6a.** Carries out numerical calculations and symbol manipulations effectively, using mental computations, pencil and paper, or other technological aids, as appropriate.
- **M6e**. Makes and uses rough sketches, schematic diagrams, or precise scale diagrams to enhance a solution.
- **A5a** the student participates in the establishment and operation of self directed work teams; that is, the student:
  - Defines roles and shares responsibilities among team members;
  - Sets objectives and time frames for the work to be completed;
  - Establishes processes for group decision making;
  - Reviews progress and makes adjustments as required.

ITEA Standards:

- Students will develop an understanding of the core concepts of technology.

  - **W.** Systems thinking applies logic and creativity with appropriate compromises in complex real-life problems.
  - **X**. Systems, which are the building blocks of technology, are embedded within larger technological, social, and environmental systems.
  - **Y.** The stability of a technological system is influenced by all of the components in the system, especially those in the feedback loop.
  - **Z.** Selecting resources involves tradeoffs between competing values, such as availability, cost, desirability, and waste.
  - **AA.** Requirements involve the identification of the criteria and constraints of a product or system and the determination of how they affect the final design and development.
  - **BB.** Optimization is an ongoing process or methodology of designing or making a product and is dependent on criteria and constraints.
  - **CC.** New Technologies create new processes.
  - **DD.** Quality control is planned process to ensure that a product, service, or system meets established criteria.
  - **EE.** Management is the process of planning, organizing, and controlling work.

Rubric

Scale/Criteria	needs to work substantively in this area in order to meet the standard 1	shows progress toward the standard 2	meets the standard 3	exceeds the standard 4
Safety rules	Does not know all the safety rules.	Does know most of the safety rules.	Knows all the safety rules	Knows all the safety rules and can recite them in a timely fashion.
Parts and materials of a roof	Does not know all the parts or materials.	Does know most of the parts and materials.	Identifies parts of a roof. Also types of material.	Identifies parts of a roof. Also types of material in a timely fashion.
Estimation	Cannot estimate all the materials needed.	Can estimate most of the materials needed.	Can estimate all the materials needed.	Can estimate all the materials needed in a timely fashion.
Application	Student does not apply the material.	Student applies all the materials, but does not meet code.	Student applies all the materials to meet code.	Student applies all the materials to meet code, in a timely fashion.

Core Learning Experience Summary Chart

Student Tasks & Instructional Methodology for Each Learning Experience		
Student Learning Experiences	**Student Tasks**	**Instructional Methodologies**
Learning Experience I	• Match terms associated with roofing to their correct definitions. • State safety rules pertaining to roofing. • Identify parts of a roof. • Identify traditional residential roof designs. • Name classes of roofing. • Draw label and define a roof system.	Use visual aids to engage the student in residential construction. Take the students on a field experience to see residential roofing designs.
Learning Experience II	• List types of roofing materials. • Identify basic types of asphalt shingles. • List guidelines for applying underlayment. • Describe general requirements for applying flashing. • List types of flashing.	Bring in different types of roofing materials so the students can visualize. Take the students on a field experience to see residential roofing designs. Give demonstration on different types of flashing and how to use it properly.
Learning Experience III	Students will estimate roofing materials needed for a three-tab asphalt shingle job. They will need to calculate • Drip edge • Water & ice • Underlayment • Starter shingles • Three-tab shingles • Flashing • Fasteners • Ridge vent • Cap • Sealant Upon completion of estimation they will need to price the material.	The instructor will facilitate the procedure of ordering materials. The formulas will be given. The instructor will give different roof sizes so that the student can practice estimating.

Description of Core Assessment: product & performance
The student will have to estimate shingles for a give roof size.(a small scale version ex. 4’X8’). Then the student will call the lumberyard to place an order. The next day they will use the material to shingle the scale version roof to code.

Student Learning Experience 1

Purpose: This lesson will expose students to roofing in residential construction.

Estimated Time: 4hrs

Standards:

E1c, E3a, E3e, 903.1 General, 902.1 Supporting construction. 902.2 Single layer underlayment. 903.4 Fasteners 903.5 Valley flashing. 903.5.1 Sheet metal, 903.5.3 Multiple layer flashing. 903.6 Side wall flashing, 903.7 Other flashing, 903.8 Hips and ridges.

Key Concepts Addressed:
- Terms associated with roofing
- Safety rules pertaining to roofing.
- Parts of a roof.
- Traditional residential roof designs.
- Classes of roofing.

Student Tasks:
- Match terms associated with roofing to their correct definitions.
- State safety rules pertaining to roofing.
- Identify parts of a roof.
- Identify traditional residential roof designs.
- Name classes of roofing.
- Draw label and define a roof system.

Explanation of how learning tasks require higher-level thinking:
The student will be asked to draw label and define parts of a roof.

Teacher Responsibilities:
- Use visual aids to engage the student in residential construction.
- Take the students on a field experience to see residential roofing designs.
- Supply informational sheets
- Give feed back
- Answer questions

Materials & Equipment:
Overheads
Informational sheets
CIMC Student work book.
CABO code book
Resources:
CIMC Student work book.
CABO code book

Student Learning Experience 2

Purpose:
This lesson will prepare students with the necessary skills to identify, and understand residential roofing.

Estimated Time: 4hrs

Standards:
903.1 General, 902.1 Supporting construction. 902.2 Single layer underlayment. 903.4 Fasteners 903.5 Valley flashing. 903.5.1 Sheet metal, 903.5.3 Multiple layer flashing. 903.6 Side wall flashing, 903.7 Other flashing, 903.8 Hips and ridges.

Key Concepts Addressed:
- Types of roofing materials.
- Types of asphalt shingles.
- Guidelines for applying underlayment.
- General requirements for applying flashing.
- Types of flashing.

Student Tasks:
- List types of roofing materials.
- Identify basic types of asphalt shingles.
- List guidelines for applying underlayment.
- Describe general requirements for applying flashing.
- List types of flashing.

Explanation of how learning tasks require higher-level thinking:
The student will be asked to draw label and define a roof with all its parts and materials, to code.

Teacher Responsibilities:
- Bring in different types of roofing materials so the students can visualize.
- Take the students on a field experience to see residential roofing designs.
- Give demonstration on different types of flashing and how to use it properly.

Materials & Equipment:
Overheads
Informational sheets
CIMC Student work book.
CABO code book
Resources:
CIMC Student work book.
CABO code book

Student Learning Experience 3

Purpose: This lesson will prepare students with the necessary skills to estimate roofing materials.

Estimated Time: 5hrs

Standards:

M6a, .M6e, W., Z., AA. 903.1 General, 902.1 Supporting construction. 902.2 Single layer underlayment. 903.4 Fasteners 903.5 Valley flashing. 903.5.1 Sheet metal, 903.5.3 Multiple layer flashing. 903.6 Side wall flashing, 903.7 Other flashing, 903.8 Hips and ridges.

Key Concepts Addressed:

Students will estimate roofing materials needed for a three-tab asphalt shingle. This type of shingle is most common in this region. The students need to be able to estimate so they know how many shingles are needed for a job. Also they need to know how many shingles because they have to price the job. Though the estimation process they will get a better understand of the materials and their importance. The students will also estimate materials needed for an architectural asphalt shingle.

Student Tasks:

Students will estimate roofing materials needed for a three-tab asphalt shingle job. They will need to calculate:

- Drip edge
- Water & ice
- Underlayment
- Starter shingles
- Three-tab shingles
- Flashing
- Fasteners
- Ridge vent
- Cap
- Sealant

Upon completion of estimation they will need to price the material.

Explanation of how learning tasks require higher-level thinking:

Makes and uses rough sketches, schematic diagrams, or precise scale diagrams to enhance a solution.

Teacher Responsibilities:

- The teacher will first teach the skills needed to estimate materials.
- The instructor will facilitate the procedure of ordering materials.
- The formulas will be given.
- The instructor will give different roof sizes so that the student can practice estimating

Materials & Equipment:
Pencil, paper, calculator,

Resources:
CIMC Student work book.
CABO code book

Core Assessment

Estimated Time: 4hrs; 2 periods on separate days to allow delivery of material.

Student Tasks (product and performance):

- Demonstrate the ability to:
  - Apply three-tab asphalt shingles.

    or
  - Apply architectural asphalt shingles

The student will have to estimate shingles for a given roof size.(a small scale version ex. 4'X8'). Then the student will call the lumberyard to place an order. The next day they will use the material to shingle the scale version roof to code.

Explanation of How Assessment Tasks Require Higher Level Thinking:

Teacher's Responsibilities:

- Over see procedure from start to finish with as little involvement as possible.
- Give the student the size of scaled roof.
- Contact the lumberyard.
- Evaluate the completed project.

Materials & Equipment:

Students' individual notes
Calculator, pencil, phone,
General tools.

Resources: